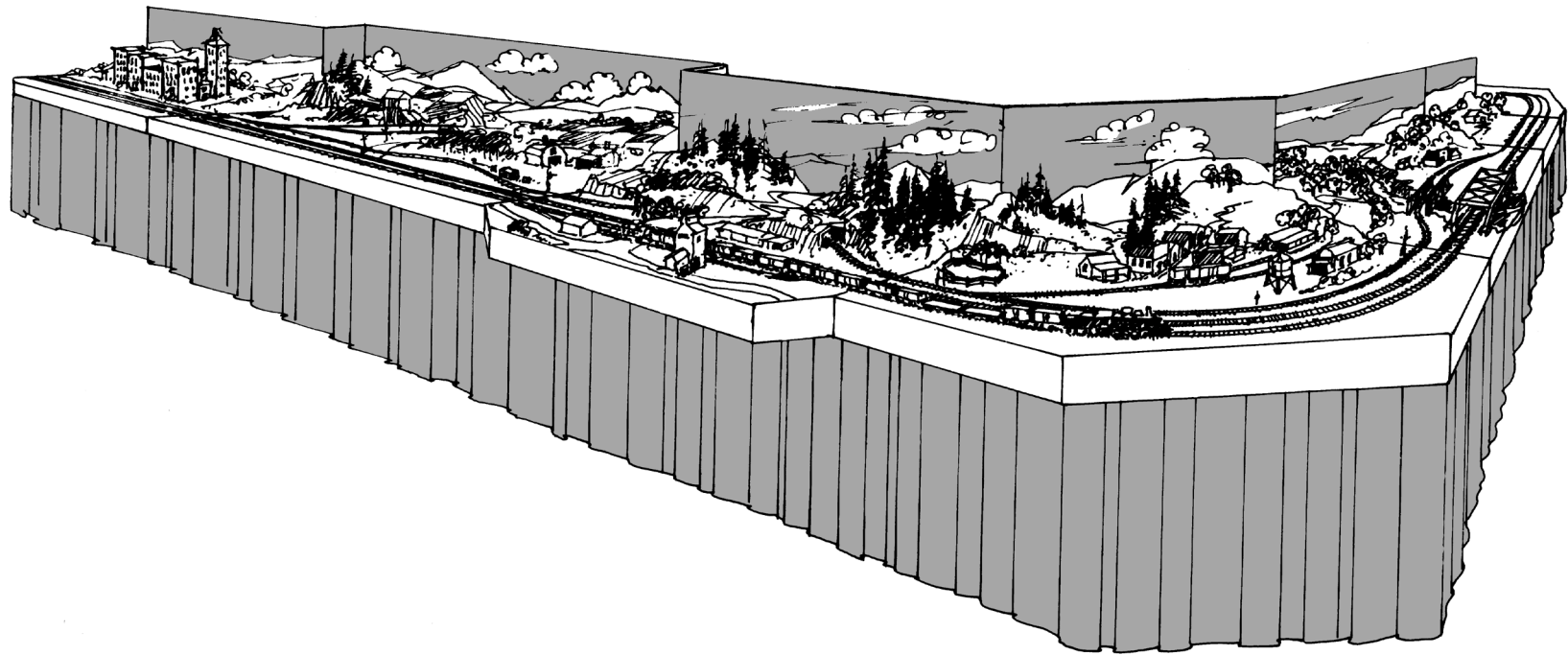


**New Wiring Info**

# **N-TRAK**

## **MODULE MANUAL**



# NTRAK Manual Specifications

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In 1973 a group of enthusiastic model railroaders got together at an N scale meet in Signal Hill, California, and talked about what they could do to help interest people in N scale and to share information about N scale. The NTRAK project resulted from that meeting and the idea

has spread throughout the model railroad hobby.

The NTRAK modules are used to build large display layouts as well as home and club layouts. Modelers from all over the world can build modules, bring them to a show, connect to the next module, and become part of a giant N scale layout. To be sure that each module fits the next one to it, a set of standards was worked out. This manual is the result of experience gained from building over 2,000 modules. They have been used for NMRA National Convention layouts since 1974 and for many regional and local layouts.

Over 100 clubs around the world are now using the modules for all or part of their club layouts. Some have semi-permanent quarters and others assemble the layout in space rented or borrowed for just that meeting. With careful attention to detail, quick assembly and reliable operation can be achieved. Some of their successful ideas are shown in this manual.

In 1996, NTRAK became a non profit corporation. Our purpose and objective

There are NTRAK clubs in most areas of the United States and Canada. There are also several clubs in Australia and England as well as clubs in Switzerland, Germany, Holland, Japan and New Zealand. Write to NTRAK for the name of your local coordinator.

NTRAK modules in other countries often use different electrical and size standards to suit local conditions. Check with your coordinator.

Note: Since the last printing (2002) of the NTRAK Manual, all 120 volt wiring has been removed from modules and Powerpole connectors were made an option. The new information is covered in this copy. The full text and explanations are on our web site: [www.ntrak.org](http://www.ntrak.org)

is to encourage and promote model railroading in N scale. Besides this manual, we keep in touch with N scalers with a Newsletter and help coordinate NTRAK layouts for public showings. These shows and publications help inform people about model railroading.

NTRAK layouts combine the beautifully detailed modules with long trains running on the two main tracks. A third track, the branch line, is used for picking up and setting out cars at the many industries along the way. You can be part of this scene by building a module. The length of the module you build will be part of the early planning. The 4' modules fit inside most cars and allow enough room for industrial and city scenes. The 6' modules will fit in most station wagons and are large enough to model many scenes. The big problem with the 8' modules is transporting them. They should be protected from the wind and rain. This means a van, pickup with a shell or covered trailer. Several modules can be combined to model a complex scene.

Since the modules are moved about, construction is a bit different from home layouts. This manual gives many ideas, but in general remember that there will be great changes in humidity and tempera-

ture, as well as vibration. The framework should be assembled with glue and screws. Weight is a problem too, so consider plastic foam mountains instead of plaster. Structures should either be well glued in place or packed separately. The key to good operation is good trackwork. One bad piece of mainline will ruin operations for everyone. The Meet Coordinator may order repairs or the module removed from the layout. Check your turnouts for gauge and that the flangeways are clear of ballast. Gently blowing a single MicroTrains® truck through the track work will show up any obstructions or tight spots.

For more copies of the manual, Newsletter subscriptions, books and supplies:

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For standards questions:  
Jim FitzGerald, 1150 Wine Country Place, Templeton, CA 93465.  
[ntrak@tcsn.net](mailto:ntrak@tcsn.net)

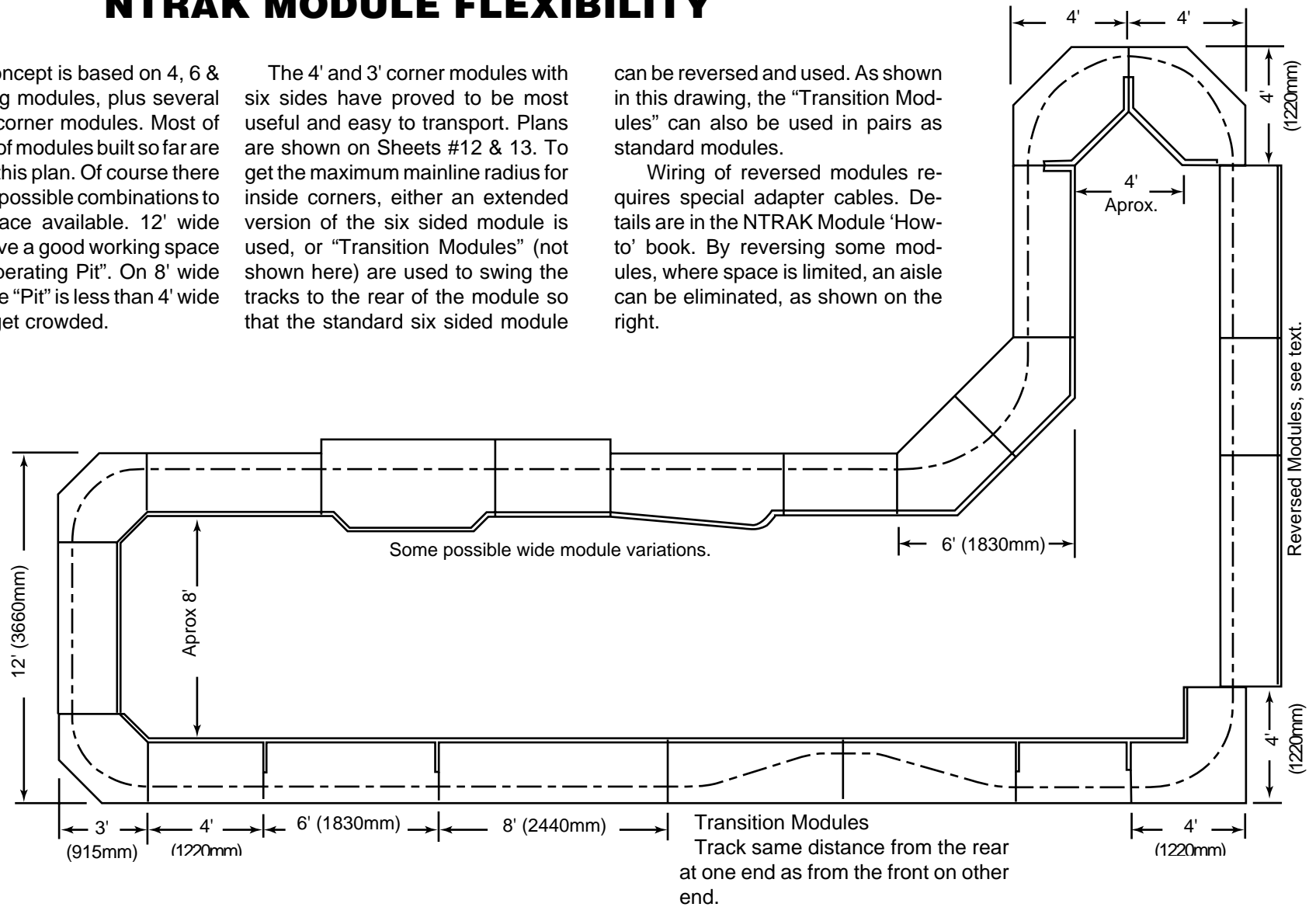
# NTRAK MODULE FLEXIBILITY

This concept is based on 4, 6 & 8 foot long modules, plus several styles of corner modules. Most of the types of modules built so far are shown in this plan. Of course there are many possible combinations to fit the space available. 12' wide layouts give a good working space in the "Operating Pit". On 8' wide layouts the "Pit" is less than 4' wide and can get crowded.

The 4' and 3' corner modules with six sides have proved to be most useful and easy to transport. Plans are shown on Sheets #12 & 13. To get the maximum mainline radius for inside corners, either an extended version of the six sided module is used, or "Transition Modules" (not shown here) are used to swing the tracks to the rear of the module so that the standard six sided module

can be reversed and used. As shown in this drawing, the "Transition Modules" can also be used in pairs as standard modules.

Wiring of reversed modules requires special adapter cables. Details are in the NTRAK Module 'How-to' book. By reversing some modules, where space is limited, an aisle can be eliminated, as shown on the right.

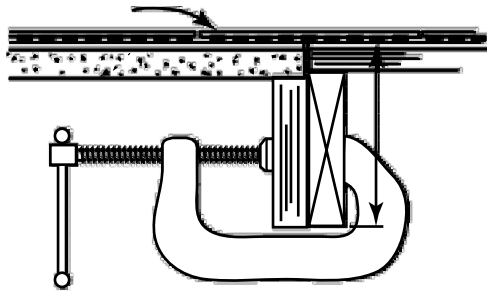


Modules are joined in layout by clamping with two "C" clamps & inserting 5" sections of Atlas "Snap Track". (Actual length 4.910")

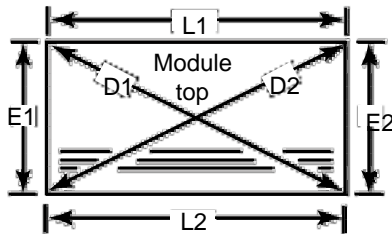
Shown on this page are the basic specifications for standard NTRAK modules. These are the minimum requirements for all modules. Optional tracks, construction methods and module sizes are given on other pages.

Several units of any length may be combined to form a "module" that is a multiple of 2' in length. (8', 14', 26', etc)

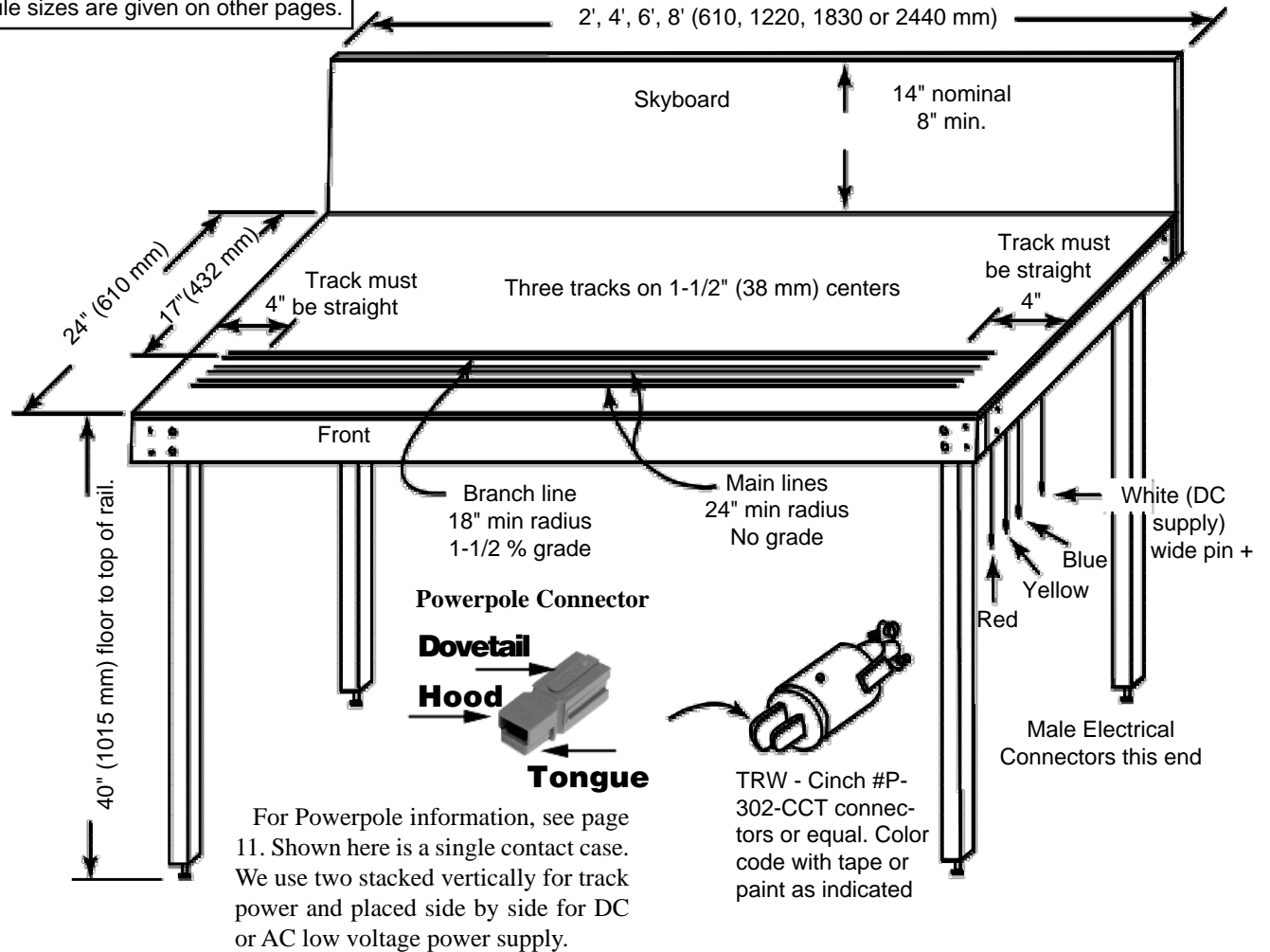
Remove the tie from one end so the rail joiners (Atlas preferred) will slide fully on. Place joiners on the other end, put in place and then, with tweezers, slide joiners into position.



The corners of your module must be square.



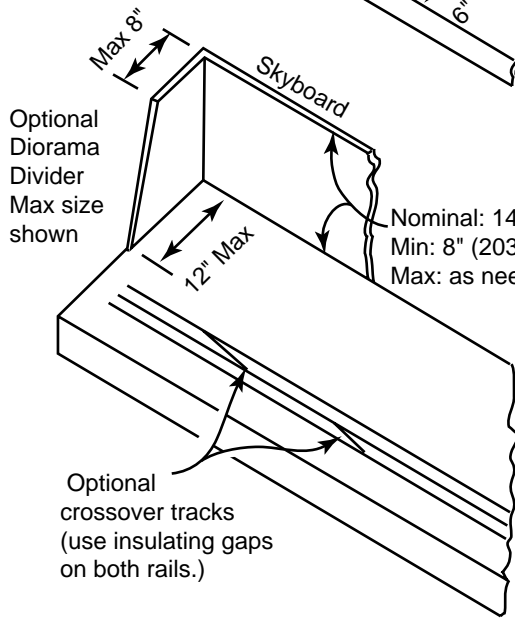
Lengths L1 & L2 should be equal, as should ends e1 & E2. Diagonal dimensions D1 & D2 should be the same



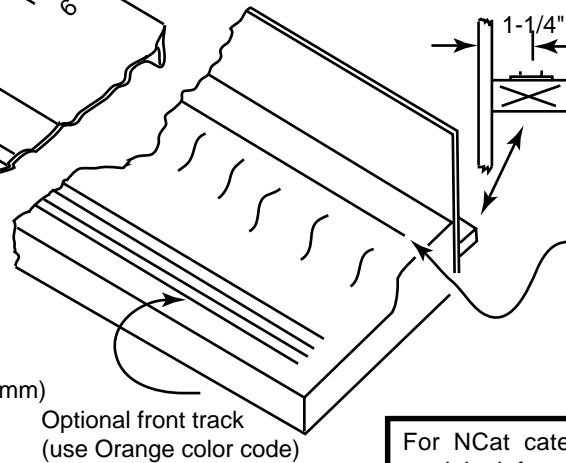
## BASIC NTRAK MODULE

Up to 6" may be added to both the front and rear of modules to make room for scenery or track plans. If extra is added at the rear, the skyboard should still come forward in some manner to match the standard position.

Optional location for Branch line. May be used within groups of modules, but must go back to standard location at the extreme ends of the module set.

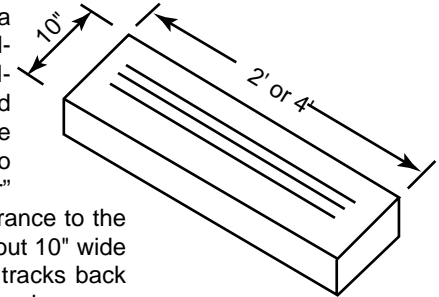


The set-up track behind the skyboard can be used for behind the scenes removal and set-up of trains. It is used by some as a return loop track within the module or for a string of modules. Color code the connectors Green with a narrow Yellow center stripe.

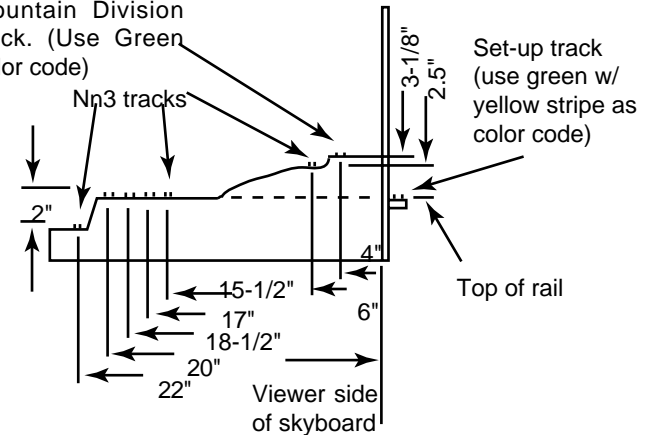


Crossover tracks between the mainlines and branch line tracks are an option. A set of each hand is helpful in any layout to shift trains from one track to another. Builders of 6' and 8' modules are asked to include a set of either hand on their modules if they fit with the track plan. Insulated gaps are needed in both rails of any crossover tracks. Peco or Atlas turnouts are preferred.

"Bridge modules" in 2' and 4' lengths are used to complete a layout with the available full size modules. One foot and three foot lengths are also useful. They also serve as "duck under" spots for easier entrance to the layout. They are about 10" wide with the front main tracks back the normal 4". Skyboards are optional and legs aren't used. Full wiring is needed.

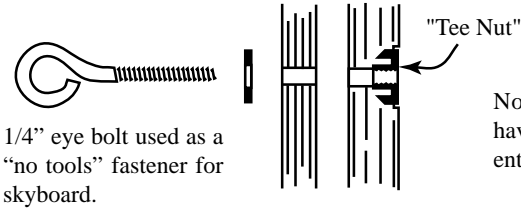
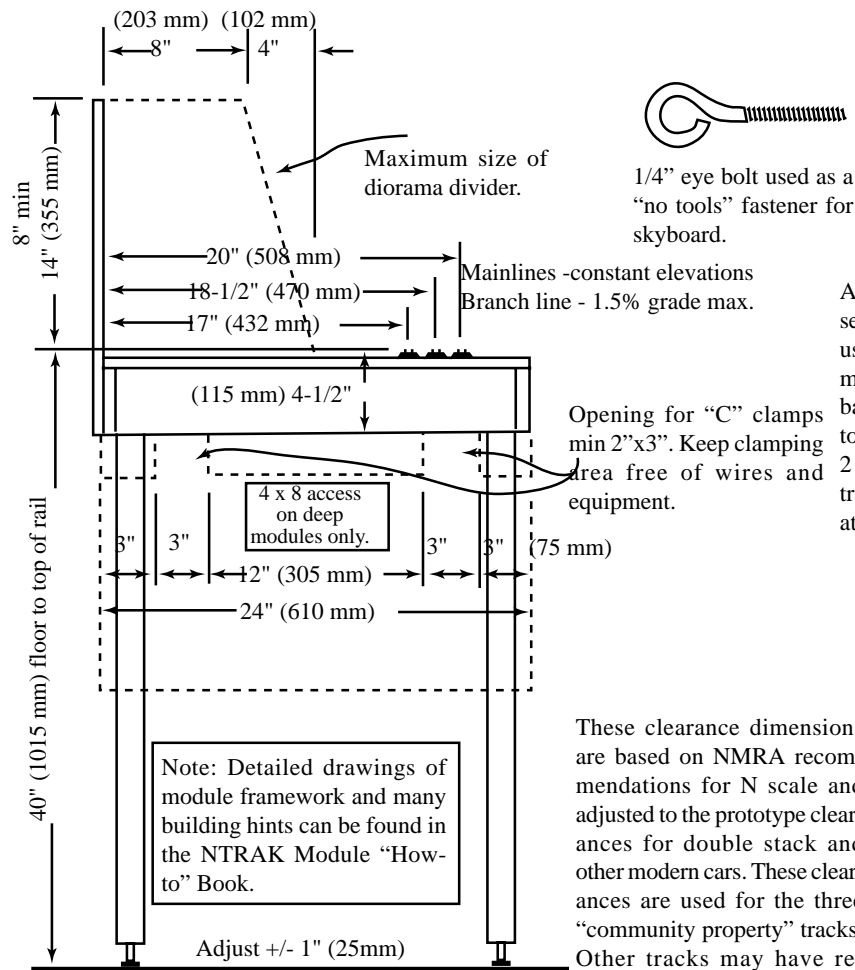


Mountain Division track. (Use Green color code)



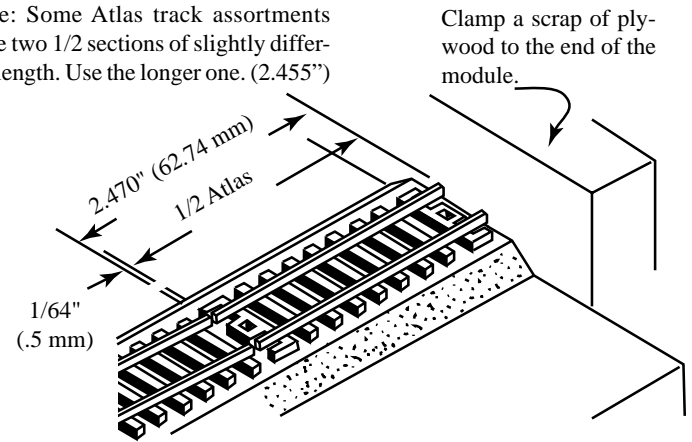
For NCat catenary module information see page 23.

Narrow gauge (Nn3) makes use of Z scale tracks. Marklin #8500 track sections (4-3/8" long) are used for connecting tracks between modules. The center (Yellow) and rear (Blue) tracks are required and the front track (Red) is an option. Color codes for the tracks are Red, Yellow, and Blue, each with a center green stripe.

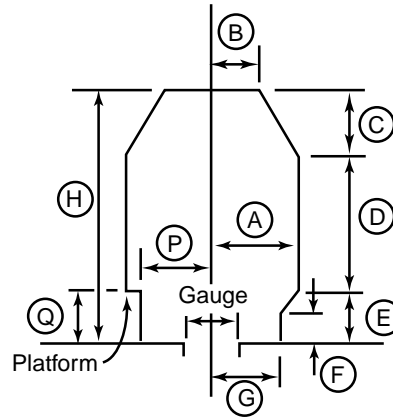


Note: Some Atlas track assortments have two 1/2 sections of slightly different length. Use the longer one. (2.455")

Atlas "Snap Track" straight 5" sections (actually 4.910" long) are used as connecting track between modules. To get the proper set back, clamp a scrap of plywood to the end of the module, use a 1/2 section of track as a guide. Lay track leaving a 1/64" gap. Repeat at the other end and cut rail to fit.

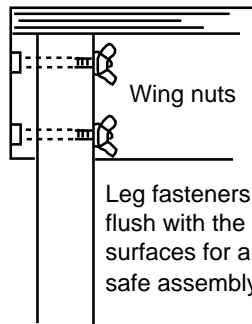


These clearance dimensions are based on NMRA recommendations for N scale and adjusted to the prototype clearances for double stack and other modern cars. These clearances are used for the three "community property" tracks. Other tracks may have restricted clearance. The NTRAK metal Clearance Gauge is available for \$4.00.



Clearance Gauge Dimensions

	Standard Gauge		Narrow Gauge	
	Proto	N	Proto	N
A	9'-0"	11/16"	6'-3"	.469"
B	4'-0"	5/16"	3'-0"	.225"
C	6'-0"	7/16"	4'-3"	.319"
D	12'-0"	29/32"	10'-0"	.750"
E	4'-0"	5/16"	2'-9"	.206"
F	2'-6"	3/16"	1'-6"	.112"
G	6'-9"	15/32"	5'-0"	.375"
H	23'-0"	1-23/32"	17'-0"	1.275"
P	6'-9"	15-32"	4'-9"	.356"
Q	4'-0"	5/16"	2'-9"	.206"

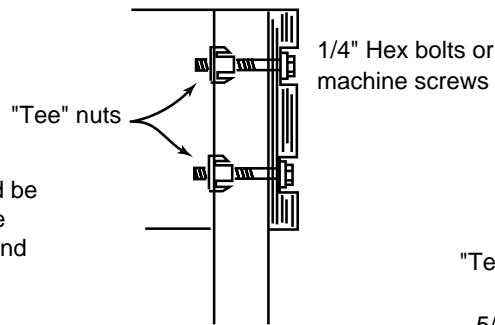
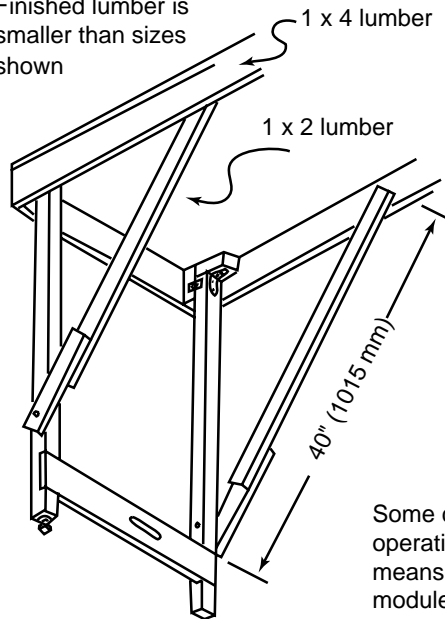


Wing nuts

Leg fasteners should be flush with the outside surfaces for a neat and safe assembly.

**Note:**

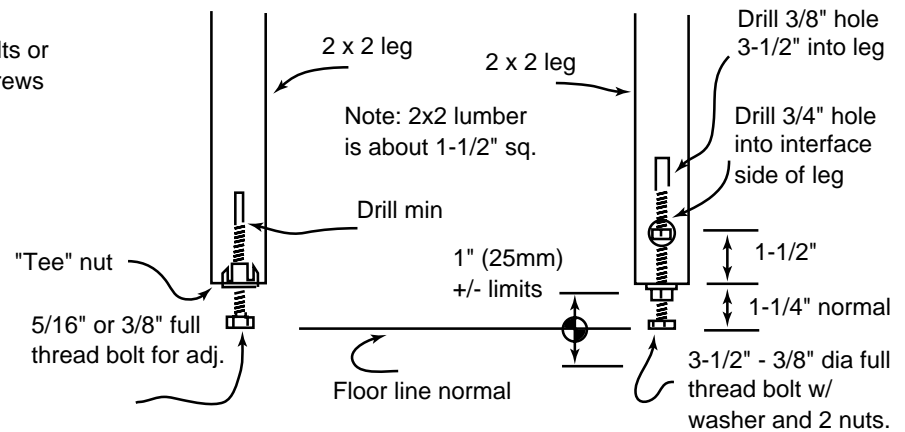
Finished lumber is smaller than sizes shown



1/4" Hex bolts or machine screws

"Tee" nuts

**Note:** Legs should be marked for the corner they go in and which module they belong to. Others may have to assemble your module at some time. Make it easy for them, and your self.



2 x 2 leg

2 x 2 leg

Note: 2x2 lumber is about 1-1/2" sq.

Drill min 1" (25mm) +/- limits

Floor line normal

"Tee" nut

5/16" or 3/8" full thread bolt for adj.

Full thread carriage bolt with hole drilled for hand adjust rod.

Drill 3/8" hole 3-1/2" into leg

Drill 3/4" hole into interface side of leg

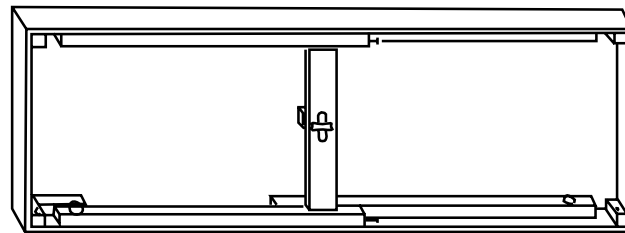
1-1/2"

1-1/4" normal

3-1/2" - 3/8" dia full thread bolt w/ washer and 2 nuts.

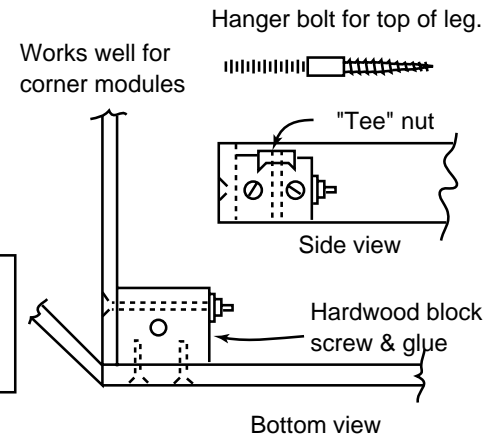
Threaded rod with "acorn" nuts may be used in place of full thread bolts.

Lag screws are very difficult to adjust. **NOT** recommended.



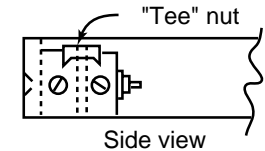
Some clubs set up their module every few weeks for operating meetings. Quick assembly and breakdown means extra time for running trains. One club calls for modules that can be set up by one person in five minutes without tools. Some use furniture legs that screw in place. Folding legs are self contained. Bracing using "Tee" nuts can be fastened with thumb screws.

**Note:** If you want modules at a different height for home use, the simplest solution is to use a second set of legs

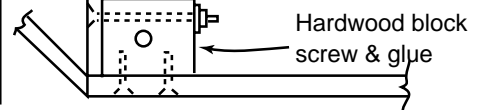


Hanger bolt for top of leg.

Works well for corner modules



Side view



Hardwood block screw & glue

Bottom view

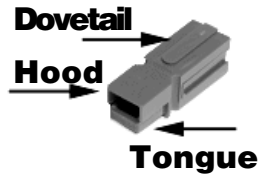
# LEG DETAILS

**NOTE:** A single large power supply is used with the many throttles on large layouts. The three tracks **MUST NOT** have any common connection. **DO NOT** use **“COMMON RAIL”** wiring. Gaps must be used on both rails on any crossover tracks. If the three main tracks are part of a yard, it must be possible to isolate them electrically.

The 120V AC wiring is no longer used on NTRAK modules. This is fully explained in this copy of the How-to Book.

Use #22 to #24 ga **solid** wire soldered to the outside of rails for connection to track power leads. “Solder terminal strips” make an easy to trouble shoot connection point. Use as many power feeds per tracks as needed.

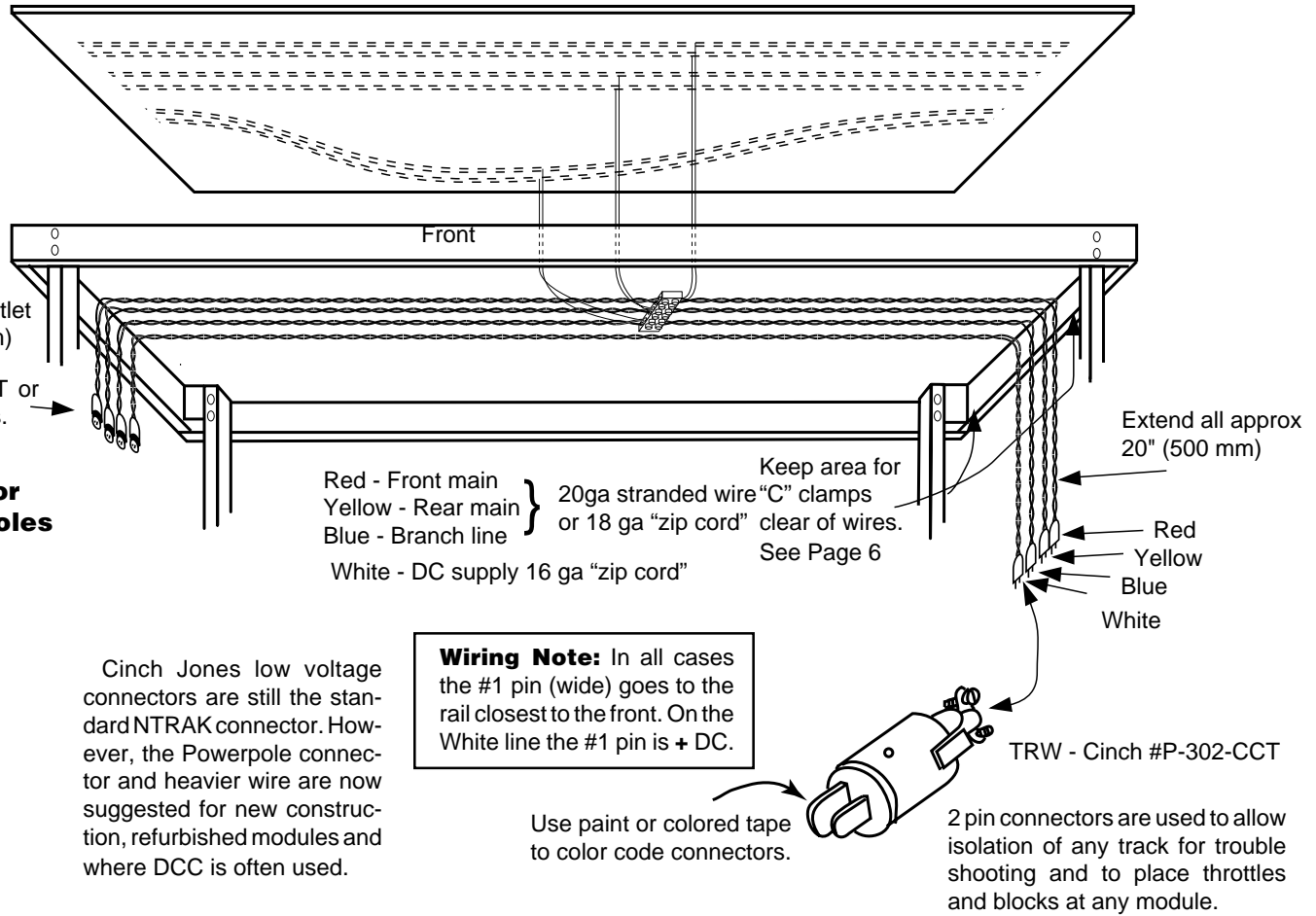
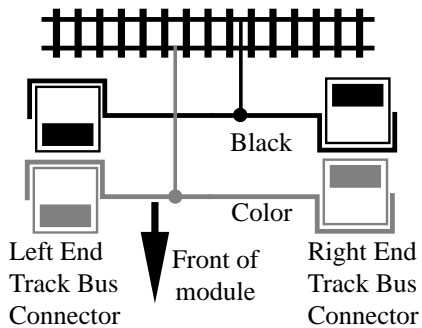
**Powerpole Connector**



Keep sockets and outlet in center 12" (305mm)

TRW - #S-302-CCT or on short length wires.

**See Page 11 for more on Powerpoles**



Red - Front main  
Yellow - Rear main  
Blue - Branch line  
White - DC supply 16 ga "zip cord"

**Wiring Note:** In all cases the #1 pin (wide) goes to the rail closest to the front. On the White line the #1 pin is + DC.

Cinch Jones low voltage connectors are still the standard NTRAK connector. However, the Powerpole connector and heavier wire are now suggested for new construction, refurbished modules and where DCC is often used.

Use paint or colored tape to color code connectors.

2 pin connectors are used to allow isolation of any track for trouble shooting and to place throttles and blocks at any module.

**NOTE:** For safety, a GFI (Ground Fault Interrupter) circuit breaker is recommended in the 120 line powering a layout.

Twin conductor lamp cord (zip cord) has a rib pattern for one side. Use for wide pin for easy checking.



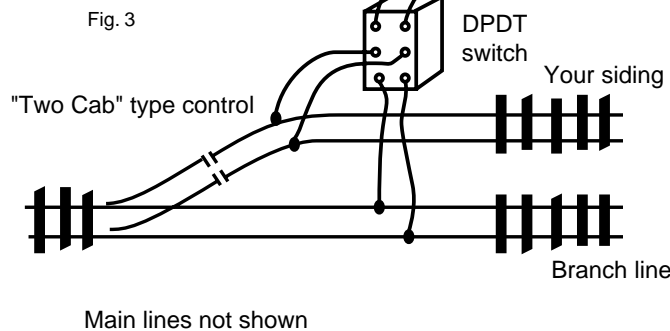
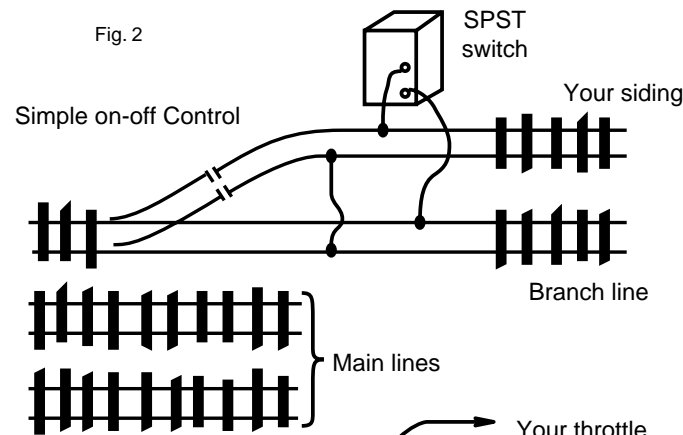
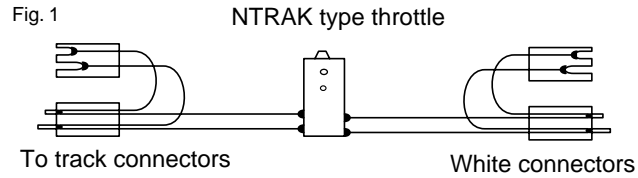
## POWERING THE LAYOUT

For small NTRAK layouts, each main can be powered by a single throttle controlling a single train per loop. With layouts over about 24' long the three tracks can be broken into four or more "blocks" each and more trains can be run. You need two blocks per train for good control. Single block loops can be powered by regular power packs fitted with Cinch two pin connectors. In the larger layouts, electrical blocks are formed by using connecting tracks with gaps or insulated rail joiners and not plugging in the connectors at the block boundaries. Each loop can be divided into several blocks, each with its own throttle. Better performance can be had using the throttle developed for NTRAK. Plans for two versions have been published in the Newsletter.

Many larger layouts are now powered with DCC. For very large NTRAK layouts with multi DCC zones, special precautions need to be taken. John Wallis, of the North Raleigh MRR Club has posted instructions and cautions on the club web site:

[www.trainweb.org/nrmrc/](http://www.trainweb.org/nrmrc/)

There are sequences needed to power up and power down the various boosters and controls, to avoid damage and loss of control.



## POWERING YOUR MODULE TRACKS

The private tracks on your module that run into the branch line track can be powered several different ways. If you have only a siding or two and don't plan more than picking up and setting out cars, then just an on - off switch (Fig 2) between your track and the branchline power is all that is needed. This way locomotives can be parked on your tracks by turning the switch off. If you plan more in the way of switching, then, so as not to tie up the branch line throttle, you should furnish your own throttle and connect it in with a DPDT, center off switch, (Fig 3). This would be "Two Cab" wiring with the branch line (blue) as one cab and your throttle as the other.

A control panel for your module should use the same color code for the mainline and branch line tracks as for the connectors. During a show others may need to operate on your module and the controls should be easy to use and clearly marked. Even if you aren't there to guide them, another operator should be able to work the turnouts and power the tracks with a minimum of confusion. An NTRAK layout is very much a joint venture, and everyone should be able to operate all parts of it. Complicated momentum throttles can cause much confusion for first time operators and are better saved for the home layout.

## WIRING CHANGES

The 120V AC wiring is no longer used on NTRAK modules. This is explained on page 13 Full information of the Fire Code restrictions are in the How-to Book and on our web site: [www.ntrak.org](http://www.ntrak.org)

Cinch Jones low voltage connectors are still the standard NTRAK connector. However, the Powerpole connector and heavier wire are now suggested for new construction, refurbished modules and where DCC is often used. Powerpoles are also less expensive than the Cinch Jones and are available through NTRAK.

More information on Powerpole connectors is on page 11. Information on working with them is on page 13, in the How-to Book and on our web site: [www.ntrak.org](http://www.ntrak.org)

## SOME WIRING TIPS

When wiring the Cinch 2 pin connectors, the #18 gauge wire can be inserted through the hole in the connector solder lug and then, when all the loose ends are in place, melt rosin core solder onto the heated wire. This is one place to use a solder gun. The heavier #16 wire is difficult to work through the hole, so simply strip back about 1/4" of insulation and "tin" the wire well with solder so that all the wires turn silver. Hold the wire flat against the lug and flow some more solder on. The lug should get hot enough that you see the molten solder flow over the surface. Let it cool without moving the parts. A vise or a helper is useful for this part of the operation. A wrap of electrical tape around one wire will keep stray wires from causing a short circuit.

**NOTE !** Be sure to slide the connector shell over the wire before soldering the wires to the connectors. You will have to unsolder the wires to get the shell on if you forget. You seldom forget more than once!

## CHECKING MODULE WIRING

At the big meets we use a special tester to make a quick check of wiring before the module is placed in the layout. The tester has a rotary switch, a number of LED lamps, a battery, con-

nectors for the three track wires and the white coded DC power wire, and rail contacts. The unit checks that the wide & narrow pins of the plugs match the wide & narrow pins of the sockets and that the proper rail is connected to each pin. It also shows if one or more rails are connected together. Plans for the tester are shown in the NTRAK 'How-to' book.

This same test can be made with a multimeter (VOM) set on "Rx1" (Resistance times one) and a test cord made by soldering an 8-1/2' length of 2 conductor wire to a male Cinch connector. Alligator clips soldered to the other end make it easier to use, if you don't have clips for your meter probes. Mark which wire goes to the wide pin. Start by plugging the test cord into the White socket and move to the plug end of the module. Touch the two VOM probes together. The meter should swing to zero Ohms. Adjust if needed. Now clip one probe to the wide pin test cord wire and touch the wide pin of the White plug with the other probe. The meter should swing close to zero. If it does and doesn't move when you touch the narrow pin, you are over the first big hurdle. If it moves only when you touch the narrow pin, then you have the wires reversed and you will have to change (at either end). If the meter moves when both pins are touched, then a strand of wire within one of the connec-

tors may be touching the other wire.

Correct any problems and recheck. Now clip to the narrow pin and check as before. You now know that the white wire pins are OK. Next, with one probe clipped to the wide pin and the test wire still connected to the White socket, touch in turn all the pins of the other connectors (Red, Yellow, and Blue). You should get no reading. You have found that there is no connection between the White wire and any other wire. Now plug the test cord into the Red socket and test the Red plug as above. If that checks OK, then touch the probe to the outside rail of the front track. The meter should go toward zero. You should get no reading as you touch, in turn, each other rail. Repeat, in turn, for the Red narrow pin, Yellow and Blue wide and narrow pins. Check the rails on either side of any turnouts and with the turnouts thrown first in one and then the other direction.

These tests will show if there is poor contact in a turnout or rail joiner, as well as connectors wired backwards or no rail gaps in crossovers.

If trouble develops during use in a layout, a track of the module may be isolated for checking by unplugging the connectors at each end and removing the connecting tracks for that track. The other two tracks may continue to operate.

## The Anderson “Powerpole” , PP30



In 2005, NTRAK adopted a “Recommended Practice” (RP) for track wiring on modules. A different type connector and heavier gauge wire are used. The original Cinch Jones connector and wiring size are still acceptable. For new construction and refurbishing old modules, we prefer that the wiring meet the new RP specifications. The RP and other explanatory material follows.

Here is the connector that is being used as an alternate to our original connector. The round sleeve on the contact will take 12 gauge stranded wire and can be soldered, crimped or both. While the wire and contacts will handle 30 amps, our application needs only 3 amps, but we benefit from the low resistance of the connectors and heavy wire.

The rugged plastic shells have dovetails that lock the individual units into a variety of combinations. We use vertical stacking for the track bus (red, yellow, blue, etc.) wires. The power bus (white) has a side by side assembly. This prevents accidental cross connections. The two pin configuration gives us the present trouble shooting ability to disconnect one track while the others remain operational.



Anderson 30A Powerpole® Connector,  
Cutaway View



Mated Powerpole Connectors,  
Cutaway View

These cut-away views show how the contacts slide over each other. These are “genderless” connectors, each side is the same, but one is upside down.

The dovetails hold the shells together, but colored tape is used to keep the dovetails from sliding and to color code the pair. When Powerpole equipped modules are connected together, the connector pairs are turned so that Black connects to Black and Red to Red. NTRAK is stocking both red and black shells and shells in all NTRAK used colors. See the NTRAK Newsletter or [www.ntrak.org](http://www.ntrak.org) for current pricing.

## NTRAK Alternate Wiring Recommended Practice, 2005

**Note:** On our web site, [www.ntrak.org](http://www.ntrak.org) you will find this RP in color and additional information on the subject.

### Purpose of the Recommended Practice

The original NTRAK standard specifying 18 gauge stranded "zip wire" for main track busses, 16 gauge for the "White" coded DC power bus and Cinch-Jones 302 Series two pin connectors remains the "standard wiring" for NTRAK modules. For individuals or clubs looking for wiring with less voltage loss, the following are "Recommended Practices" (RPs) which should be considered for new construction, refurbishing of existing modules and for modules used primarily with Digital Command Control (DCC). The goal of this RP is to provide a common approach to reducing wire and connector losses and to increase the number of power feeds to the tracks.

### RP— Track Bus

Each NTRAK track (red, yellow, blue, green, etc.) shall have a continuous (unbroken) electrical bus running the length of the module. The bus shall be 12-gauge stranded copper zip wire (red/black zip wire, outdoor low-voltage lighting wire or speaker wire), or equivalent. This wire has a thin section between the two wires and can be "zipped" apart. One side of the covering has a rib molded along its length; connect the ribbed wire (or red wire in the case of red/black zip wire) to the front rail of the associated track and to the red or colored connector at the end of each bus.

The length of the bus wire is the length of the module plus 12" at each end.

### RP- Connectors

Each bus will be connected to other modules using Anderson PP30 30 Amp Powerpole connectors at each end of the module, as follows:

### RP— Color Coding

If red/black pairs of Powerpole connectors are used, they shall be color coded with tape or paint in accordance with NTRAK color standards, as shown in the 2nd column of the color chart above. Alternately, appropriate colored Powerpole housings may be used as shown in the 3rd column above.

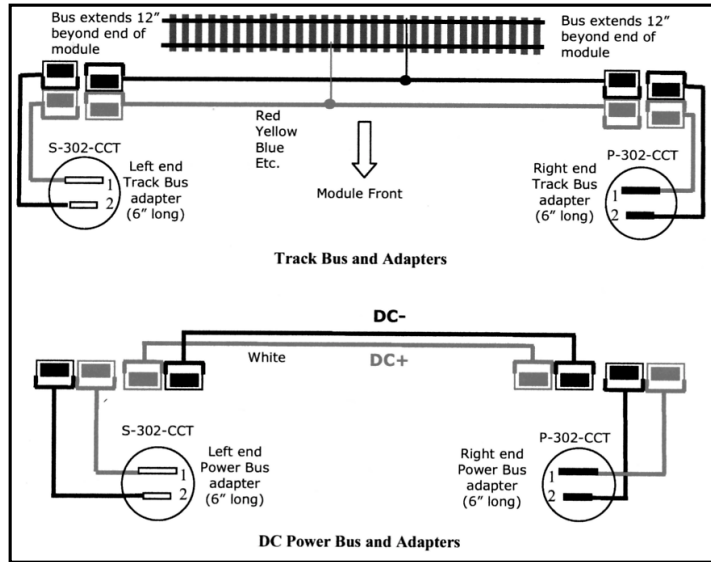
### RP — Track Feeders

Each track shall be connected to its corresponding electrical bus by pairs of feeder wires located every two feet beginning one foot from the module end. One or two foot long modules require only one feeder per track located at the center of the module. Solid core 18–22 gauge insulated wire shall be soldered to the outside or bottom of the rails and to the electrical bus. Feeder wires should be kept as short as possible.

Alternatively, the track feeder may be soldered to the rails as described in the paragraph above and connected to a terminal strip. The unbroken track bus shall connect to the terminal strip by wrapping the electrical bus around one screw or by a drop wire soldered to the bus which is then

terminated on the terminal strip for distribution. This will permit correcting any wiring errors eas-

ily. Screw terminals shall be securely tightened and checked for tightness before each train show.



Track Designation	NTRAK Colors	Tape or Paint	Powerpole Shell Colors
DC Supply	White		White/Black
Front Main	Red		Red/Black
Rear Main	Yellow		Yellow/Black
Branch Line	Blue		Blue/Black
Branch Line 2	Blue/Yellow		Blue/Yellow
Mountain Div.	Green		Green/Black
Set-up Track	Green/Yellow		Green/Yellow
Ft Passing Track	Orange		Orange/Black
Nn3 Front Trk	Red/Green		Red/Green
Nn3 Center Trk	Yellow/Green		Yellow/Green
Nn3 Rear Trk	Blue/Green		Blue/Green
Low Voltage Supply	Brown		Brown/Black

Note 1: Turnouts shall have feeders installed at both ends for all mainline tracks, with appropriate insulated joiners/gaps at the frog end.

Note 2: If unsoldered rail joints are used at any location on the mainline tracks, a feeder shall be present on both sides of the unsoldered joints.

### RP— Private Tracks

If the track(s) will only be powered from the connecting NTRAK track, then simply connect a pair of feeders from the connecting track bus to the private track. (If the turnouts are Electrofrog be sure to gap both (2) frog rails at the frog end of the turnout.)

If it is desired to provide alternate local power for private tracks (DC power pack or separate DCC booster), use a DPDT switch. This is, in effect, two cab wiring with the connecting NTRAK track as the primary cab and the local DC power pack or DCC booster as the “local” cab.

### RP— White Wire

The White Wire is NOT required for DCC operation; however, for compatibility with existing NTRAK modules the white wire must be included in the module wiring. While the NTRAK Electrical Standard specifies 16-gauge stranded "zip cord" with Cinch-Jones connectors on each end this Recommended Practice recommends the same 12-gauge wire used for the Electrical Bus. For the White Wire, Powerpole connectors at both module ends shall be arranged horizontally, red (DC+) on the left and black (DC-) on right, as shown below

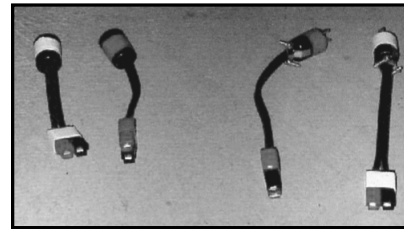
Use of the White Wire for private track powering or accessories is prohibited.

The use of the White Wire for 16VAC supply to DCC Boosters is not permitted, for safety reasons. Boosters shall be powered with a dedicated 120V to 16VAC power supply for each Booster.

Individual modules or groups of modules may use Brown/Black coded wire for 12-16 V AC for on module power needs. See page 15.



Left end Track Bus, Black over Red



Power Pole to Cinch-Jones adapter cables  
White coded are for Power bus. Color coded for a Track bus (Male and Female needed for each track.)



Right end Track Bus, Red over Black



Power Bus, side by side, White code, 12 VDC Brown code. 14-16 VAC.

## Anderson Powerpole® Assembly Instructions

Anderson Powerpole connectors may be soldered and/or crimped. Crimping takes only a fraction of the time and, if properly done, provides an electrical connection that is superior to what can be achieved by the vast majority of modelers using solder.

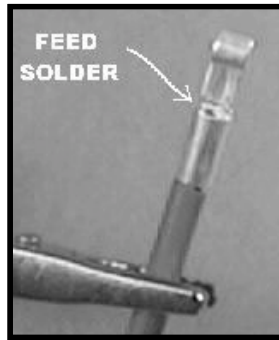
### PREPARATION

Strip the wire back 5/16 inch, just enough for the wire to fully fit into the contact barrel. Orient the contact on the wire so that it will not need to be twisted when inserted into the connector shell. Wire smaller than #14 may be doubled or tripled over to fill the contact opening.

### SOLDERING

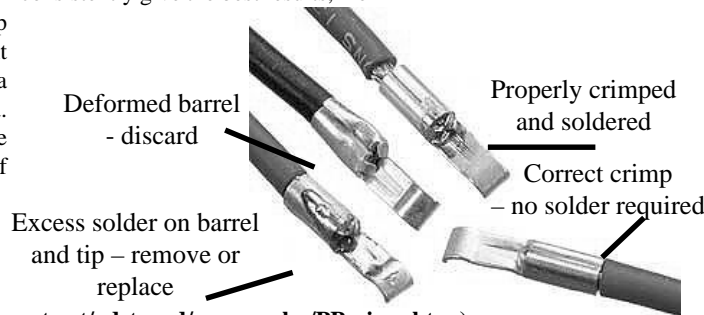
Use the proper soldering iron, (40 to 125 watts with a 1/8 to 1/4-inch tip) and good electronics grade solder. (Never use acid flux plumbing solder!) The iron should cause the solder to flow nicely into the joint within a few seconds. It is important to have the iron tip clean and shiny and tinned with a fresh coating of solder.

If possible, clamp the wire in a small bench vise with the stripped end up and the contact in place on the wire. Put the iron tip on the contact at the end of the wire and flow just enough solder between the iron tip and the contact to “wet” this junction. Once solder starts to flow, add only enough additional solder so that it flows into the inside of the contact barrel and the core of the wire. Too much solder can begin to flow down into the wire’s insulation, reducing flexibility, which may cause the wire to break with repeated flexing. Inspect the completed joint - there should not be any solder on the outside of the contact. If there is, you may file or scrape it off. If there is solder on the contact-mating surface, redo the connection with a new contact



### CRIMPING

It is important to use the correct type of crimping tool. Although a full ratchet crimper will consistently give the best results, inexpensive pliers-type crimp tools can do an excellent job as well, although a little practice is required. Both types are available from a number of sources.



(See <http://home.comcast.net/~dstuard/powerpoles/PPcrimp.htm> ).

Place the contact in the appropriate crimper die, with the seam of the contact barrel against the concave portion of the die. Crimp down firmly, using not quite full force but not bottoming out the tool. You will notice that the barrel is now slightly wider than it was originally.



After the initial crimp, the barrel may need to be reformed to allow proper insertion into the housing. Rotate the barrel 90 degrees and place it in the contact-forming die. Squeeze it again, but not as firmly as before to restore the outline of the barrel so that the contact will insert easily into the connector shell. Repeat the first crimp if necessary, but with less pressure.



Note: In order to ensure full contact pressure, be sure that after crimping and reforming, the contact tip has not been bent down. The profile should be the same as a new contact.

### CONNECTOR ASSEMBLY

Before inserting the wires, slide (do not snap) the connector shells together in the desired configuration using the molded in dovetails.

Insert the wires with attached contacts into the shells with the tips of the contacts arching down towards the stainless steel springs. Push them in until they click.



If you have difficulty pushing a contact in, be sure that there is no excess solder on the contact tip or barrel, the contact is not bent, and that the contact is rotated properly with respect to the housing. Once you have properly assembled the connector, the wire and contact should “float” slightly inside the housing and cannot be pulled out.

If you need to remove a contact from its housing, a small jeweler’s screwdriver or X-acto knife tip can be inserted under the contact tip to disengage it from the spring. The contact and wire may then be pulled out from the rear



To prevent slippage, it is recommended that the shells be secured together by wrapping the rear half of each pair with colored tape. Standard NTRAK color coding applies.

# NTRAK Layout Wiring

## NTRAK 120 V AC Wiring Introduction

There have been major changes in the way we wire NTRAK Modules and NTRAK Layouts. The change that effects all current modules and the way we power NTRAK Layouts is the result of recent changes in Fire Codes. The enforcement of these codes is a local issue, so may not apply in your local area, but the Recommended Practices (RP) outlined will, we believe, bring NTRAK modules and Layouts into compliance with the new codes. All NTRAK Layouts in public places are subject to possible Fire Marshal inspection.

No longer permitted is the hooking together of "Power strips" in a daisy chain fashion. Also, extension cords can no longer be "daisy

chained". Any power strips should be removed from existing modules. Only Heavy Duty cords may be used, not the common household extension cords. Power strips or multi-tap cubes may not be plugged into an extension cord.

What this leads to is a commercial grade, UL approved, power strip (called a "Relocatable Power Tap" in the code) plugged into the wall and extension cords plugged into it. Power (120 VAC) is no longer distributed around the layout through module mounted power strips.

Individual modules may have 120V AC devices for lighting, animation or local train power, but these devices should be plugged into an extension cord going to a facility power outlet. Read on for more details.

## The New Look for NTRAK Layout Wiring



The photo at the left shows examples of the main components needed now to get power to an NTRAK layout in a public building. Plugged into the wall outlet is an optional "GFCI" (Ground Fault Circuit Interrupter) in the form of a unit that plugs into the outlet and has a short three wire, heavy duty cord. The Commercial Grade "Relocatable Power Tap" (what we have called "Power Strip") plugs into the GFCI cord. The Power Tap has a 15' power cord, a steel body, 8 outlets with rubber covers and a 15 amp circuit breaker/switch. Triple outlet end extension cords plug into the Power Tap. All the layout items needing power then plug into the extension cords. With eight extension cords, 24 items could be powered, as long as the draw doesn't total over 15 amps.

Shown below are the key units that I was able to purchase locally off the shelf. There are many sources for similar items on store and on line order web sites.



The 8 outlet unit shown is made for Stanley Works by Belkin and was purchased at Home Depot as a "duo" package with the GFCI unit for just under \$30.



The 25' extension cord (sometimes called a "Power Block") came from Ace Hardware and was less than \$20. It is rated as "Heavy Duty", 15 Amp, 14/3 wire in a "SJ" type cord. Over 50' should be 12/3 Gauge wire. Home built or repaired cords are not accepted.

Note: The following has been reviewed and accepted by the Eugene, OR Fire Marshal. Future changes will be made as needed. Check our web site for current information. [www.ntrak.org](http://www.ntrak.org)

Jim F.

### AC Power distribution on NTRAK Model Train Modules

The following NTRAK guidelines are based upon Chapter 6, Section 605 of the International Fire Code and applicable sections of Underwriters Laboratories Product Standards UL-817 (Cord Sets and Power Supply Cords) and UL-1363 (Relocatable Power Taps), and are believed to comply with most local codes. In the event of discrepancies, local codes will govern. If there are any questions, consult your local fire marshal.

1) Remove all power strips from modules. Also, remove any module to module AC power cords and outlets from modules.

2) Use a grounded (3-wire) commercial quality power strip (14 AWG cord, preferably 15 ft long) with 15A circuit breaker to plug into an approved branch circuit wall outlet or power drop.

3) Although not required, a GFCI adapter or GFCI pigtail inserted between the outlet and the power strip is recommended. Alternately, a GFCI equipped power strip may be used in 2) above.

4) Grounded, UL approved (no home brew!) multi-outlet extension cords (triple outlet at the end, or multiple outlets along the length of the cord) should be used to distribute 120 VAC from the power strip to points of need on the layout. Extension cords should be 14 AWG minimum for up to 50 ft, 12 AWG for 50 to 100 ft.

Extension cords should be placed, wherever possible, in non foot traffic areas but not concealed or covered by equipment. Exten-

sion cords can be temporarily attached along the bottom of modules above floor using twist ties, zip ties, S-hooks, etc. No permanent attachment is permitted. Cords should not be routed through clamps and or holes in module frames. This should be done neatly.

Damaged cords should be discarded and replaced. Repairs should not be attempted.

Cords that must be placed in areas subject to foot traffic should be, at minimum, secured to floor along their length with tape.

In some jurisdictions, Extension cords subjected to foot or equipment traffic must be further protected from damage:

\* Cords 3/8" or less in diameter must be covered with hard plastic "office cord covers" or an approved alternate method.

\* Cords larger than 3/8" in diameter must use a plywood ramp style cover, or an approved alternate method.

\* All cord covers must be secured in place using tape, nails or other methods.

5) Power supplies for throttles, boosters and accessories must be off-module, either on the floor or a suitable cabinet or shelf under the layout. (This includes "wall-warts").

6) Throttle, booster and accessory power supply line cords and wall-warts should be plugged directly into the extension cord outlets. "Power cubes", multi-taps or other outlet expansion adapters shall not be used.

Several things have changed since the NTRAK Manual was last printed in 2002.

### Radio Throttles

On large layouts we are seeing more use of Radio Throttles. These allow the operator to follow a train without having to plug a throttle in as you go. DCC as well as AristoCraft Radio throttles are being used. The AristoCraft is designed for G scale trains sold by Polk Hobbies. A throttle is placed under the layout and connected to the track for each electrical block. The radio unit controls the throttle and hence the locomotive. No special decoders are needed, just "out of the box" locomotives. The Radio has a different code for each block, so the same radio is used on a trip around the layout by just switching channels.

### Atlas code 80 Turnouts

Atlas redesigned the code 80 track and turnouts previously made in Austria. We have had no problems with Atlas 2700 series turnouts marked USA or China. They may be used on the mainlines as well as on your own tracks. For crossing from one track to the next, the #6 size turnouts are preferred.

### Code 55 Track

While handlaid track of any size is not used on the three "Community Property" tracks, Peco code 55 track and turnouts have proved quite satisfactory. The flex track is very rugged and not easily dam-

aged because of the lower flange being buried in the ties. Unfortunately we haven't found an easy way to fit Atlas connecting tracks between modules and ask that the last couple of inches be Atlas code 80 track with the permanent rail transition built into your module.

As this was written in mid 2002, Atlas had just introduced code 55 track. On the original production track, MicroTrains® standard wheels hit the spikes. For this reason we are not allowing this track on the three main NTRAK tracks. If the dies are changed so that the majority of equipment will run OK, then it will be allowed.

### "S" Bend Trackwork

When doing an "S" bend in your trackwork, you need to have a straight section the length of an 85' car (6-3/8") between the end of one curve and the start of the next curve. This will reduce the chance of derailment due to the overhanging couplers.

### Clearance Standards

On sheet 6 we have clearance gauge dimensions. These have been changed to the new dimensions the railroads are now using because of double stack sizes. The new width is 18 feet and height is 23 feet. The old was a width of 16 feet and a height of 22 feet. On an NTRAK layout we will have all eras of trains in operation, so we need to use the modern clearances for our modules. NTRAK has a metal gauge that may be used to check your bridges and tunnels.

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**NOTE:** NTRAK Standards and Recommended Practices are intended to insure the successful interconnection and interoperation of modules. How modules are hooked up to venue power is outside of NTRAK's control and individuals and/or clubs can do anything they wish, realizing that other codes and standards may apply. NTRAK will not knowingly advocate anything that is against code. The Recommended Practices in this document offer an approach that, to the best of NTRAK's knowledge, will be code compliant in the great majority of cases. Whether or not an individual and/or group decides to implement these recommendations is up to them

The full RP for 120 V AC wiring is printed in the current NTRAK Module 'How-to' Book and on our web site:

[www.ntrak.org](http://www.ntrak.org).

### Local option power

For those who need power to their module for lighting, animation or track power, a low voltage wire that is coded brown can be used for 12-16 V DC. This wire would have the side by side Powerpole configuration, as with the white line, It could be on just one module or a group of modules. There would be a single source for the low voltage AC such as a power pack or an outdoor lighting transformer.

A bridge rectifier could be used to convert to DC, as needed. The power source would plug into one of the layout extension cords. The brown wire would only be added to modules needing the extra power and not to every module in the club.

The low voltage wiring is not subject to Fire Regulations, but should be done in a neat and safe way.

FOUR FOOT CORNER

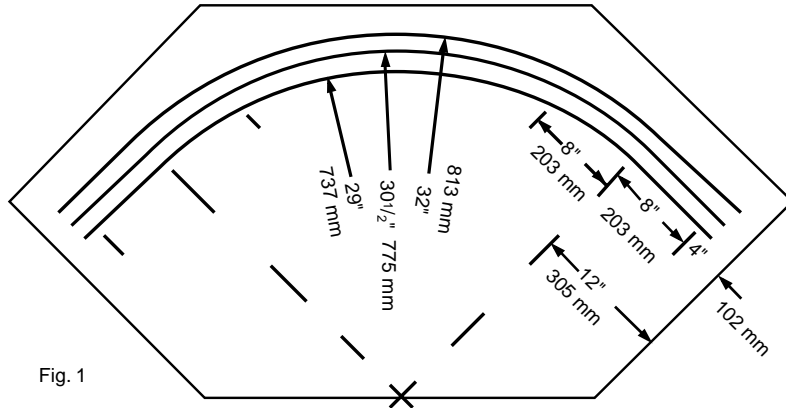


Fig. 1

THREE FOOT CORNER

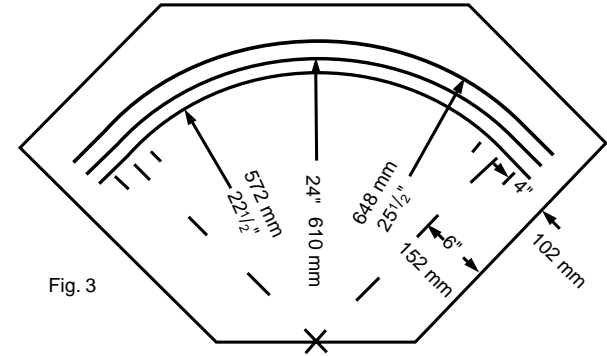


Fig. 3

1/2" or 3/8" plywood top  
1 x 4 or 1/2" ply framing

Assemble with screws and glue.

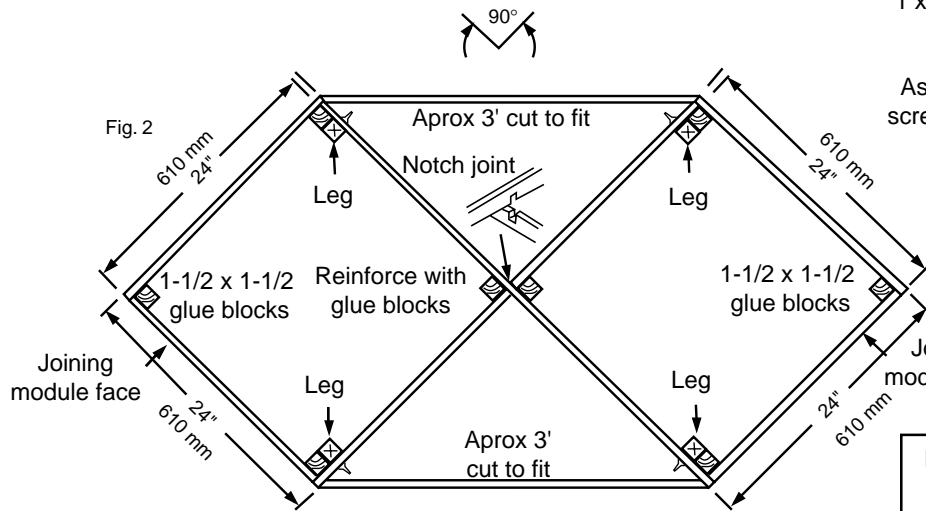


Fig. 2

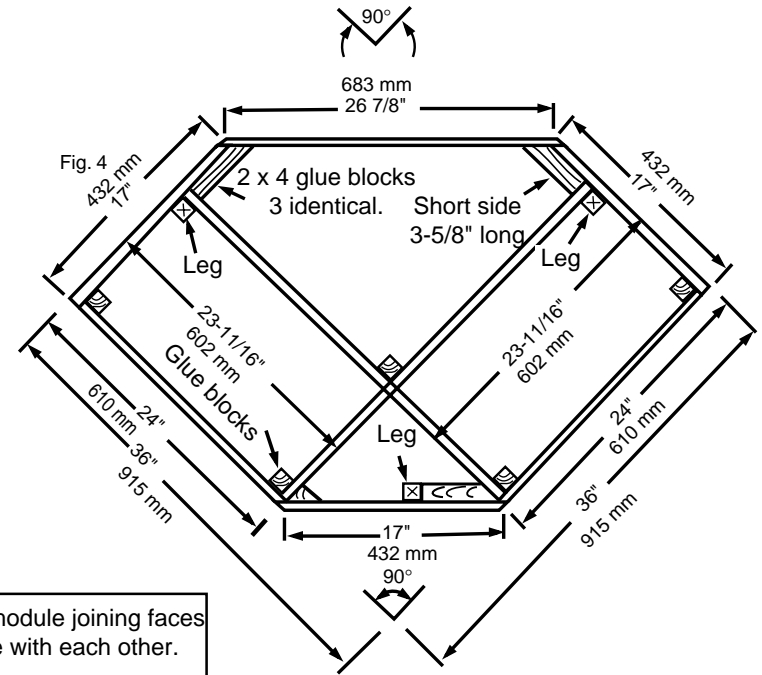


Fig. 4

Note: The two module joining faces must be square with each other.



The six sided NTRAK corner modules are basically a 4' or 3' square with two corners cut off. The 4' corners are almost 6 feet long and 34" wide, giving them room for a roundhouse or other larger scenes. A similar corner module based on a 3' square is easier to store and transport. A layout can be assembled with a mixture of two 4' and two 3' corners.

All key dimensions are given, but some dimensions are not given since they are governed by the thickness of the materials used. Where the two braces cross, they could be notched to fit together, or one could be solid and the other in two pieces that butt against it. The use of screws, glue, and glue blocks will make a solid and long lasting base for your track and scenery.

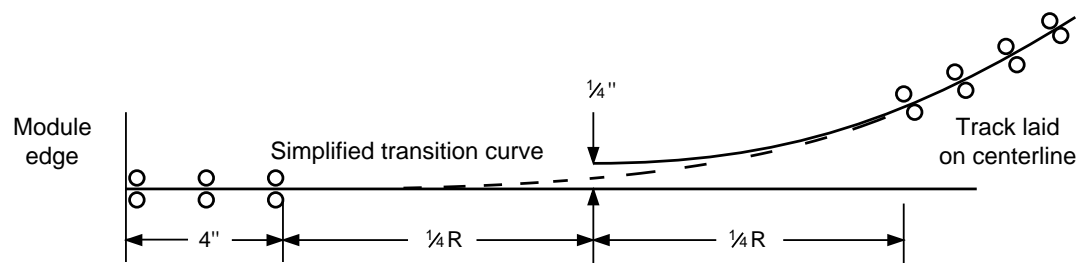
NOTE: It is most important that the two faces that mate with other modules be square with each other. If you use a plywood top, use a factory cut corner for these two faces. If you build an open grid version, the use of the corner of a plywood sheet as a square during assembly is suggested.

Datasheets with full instructions for building a jig for assembling either size corner module or any straight module is available from NTRAK, Inc. The jig is suitable for club use when building a number of modules.

A transition curve is needed where a curved length of track meets a tangent (straight) track. The transition will avoid the misalignment of the ends of longer cars as they pass from the curve to tangent track.

Superelevation (banked curves) are not recommended. Longer trains can be run with flat curves than can be run with superelevation.

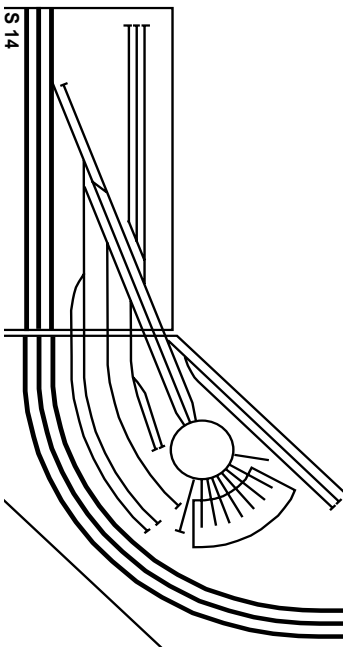
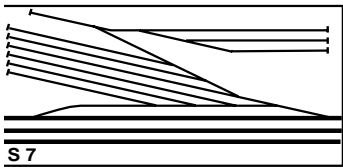
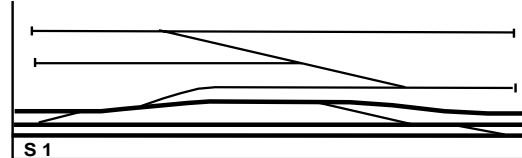
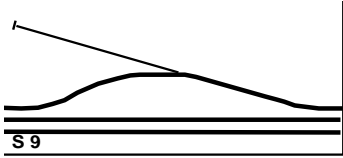
A smooth transition at the ends of a curve can be laid



out by eye by using flex track as a "bent stick", as shown here. The first 1-1/2" of track must be straight to meet NTRAK specs (4" in from end of module). It is suggested that track be extended to or beyond the module edge and then trimmed to length after the laying of the transition curve is completed. This will make it easier to keep the 1-1/2" length straight. The track is restrained by pins or nails at the points marked with small circles. Check it out by pushing several long passenger cars through the transition. If the ends of the long cars stay aligned coming out of the curve, without relative motion from side to side, then the transition is good. If not adjust the track and recheck. Avoid sharp kinks in the rails.

Where two pieces of track must be joined on a curve, solder the rail joiners in place with the track straight and then form the curve.

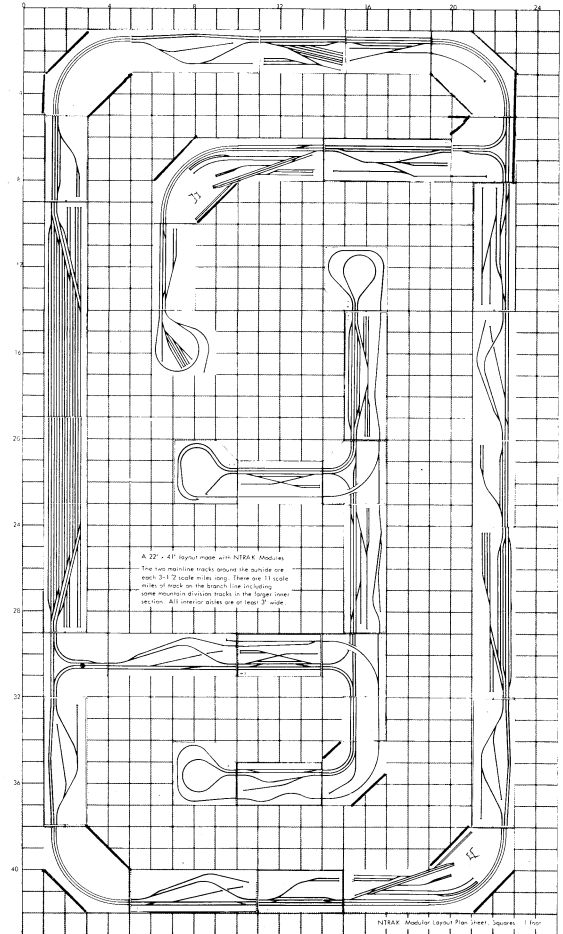
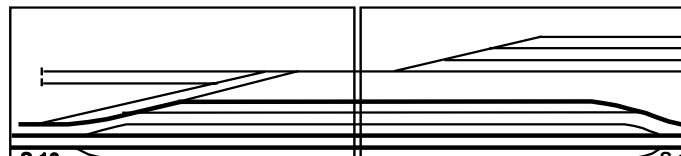
There isn't enough room for a full transition on the three foot corner, but enough easing can be done to make problems with long cars minimal on these corners.



These track plans are among the over 100 plans, drawn to 1/2"=1' scale, shown in the Track Plan Set available from NTRAK. Plan S-9 shows the branchline swinging away from the mainlines and has a simple siding that leaves ample room for scenery on the four foot module. Plan S-7 on the other hand puts a maximum of track on a four foot module. Plan S-1 gives room for several industries and interesting switching problems on a six foot module.

Two or more modules can be combined and always used together. With S-14 & C-11 a corner and a four foot module have been combined for a terminal facility. This makes an excellent end for a point to point layout. Below are two modules combined for a through passenger terminal.

The big layout is 22'x41' is also made from the Track Plan Set and would make an excellent club layout. Photos of many of the template modules are shown in the NTRAK Module 'How-to' Book.

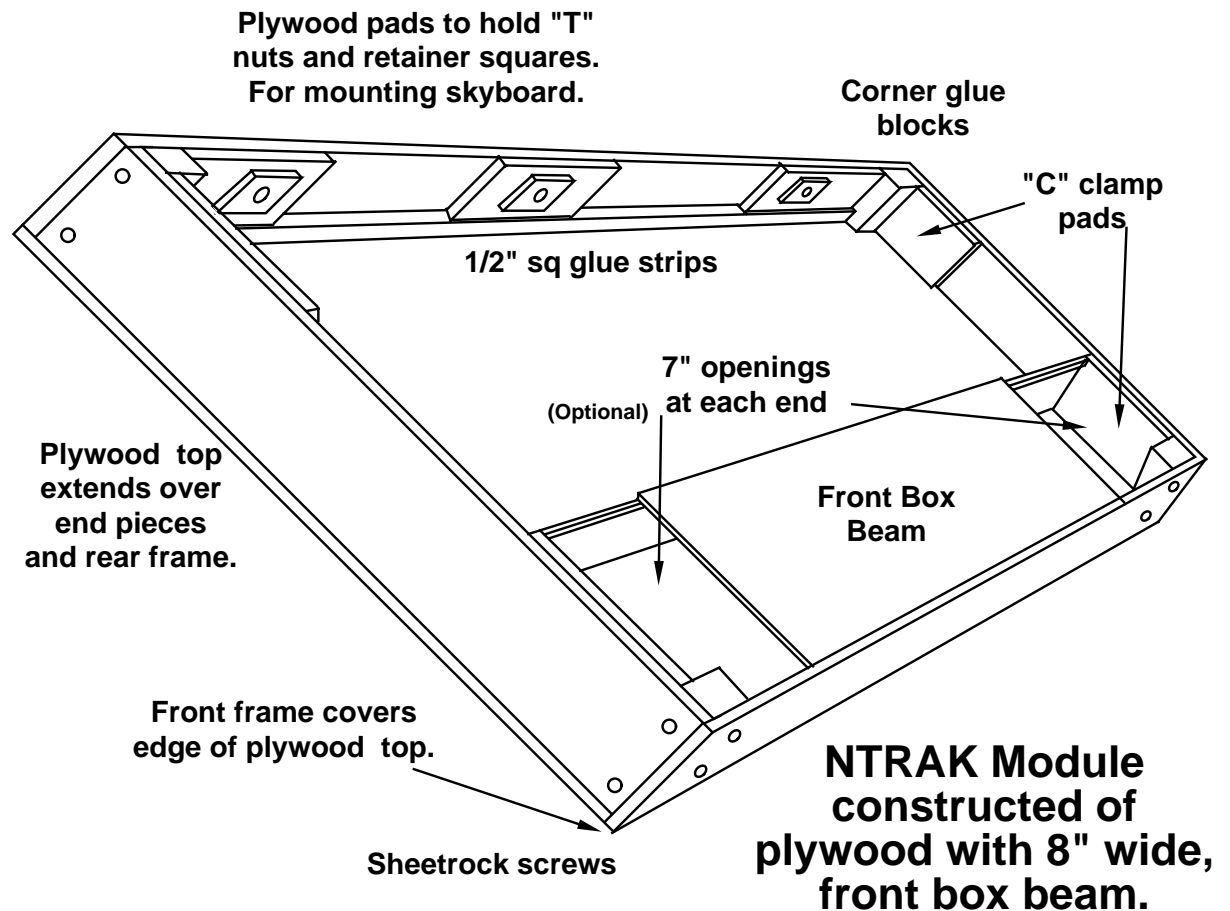


## Lighter Weight Modules

The frame design shown in the manual has been used since the beginning of NTRAK. It uses easy to find materials and can be made with simple tools and with basic woodworking skills. A much lighter frame can be built along the same lines as the original design, but using 1/2" plywood for the four frame pieces and 3/8" plywood for the top and skyboard. If you use three bolts to hold the skyboard in place, it becomes structural and adds stiffness.

If you have power tools available, then even lighter weight modules can be built. One such design is shown here. It uses 3/8" plywood for the frame pieces. They are doubled where the "C" clamps go and where the "T" nuts hold the skyboard in place. The top could be 3/8" plywood, or if the extra "box beam" is used, the top would have extra support and 1/4" thick ply would be suitable. The box beam stiffens the module and reduces both sag and twist. Glue strips are used at the seams and glue blocks for the corners.

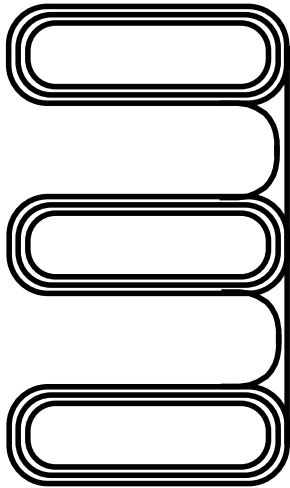
A full discussion of the lighter weight designs is covered in Data Sheet #4.3.1.



## Junction Modules

To join several clubs into one big layout, the Junction Module was developed by Matt Schaefer and the Northern Virginia NTRAK Club. The design was inspired by the six sided "Diamond Mill" by Dave Savage and Paul Miller. It was used for the huge '93 Valley Forge layout.

The dotted lines show the concept of adding an extension to a corner module. The actual junction module frames are made just for their use and ignore the dotted line shown. A 3' size is shown. Some 4' versions are also used.



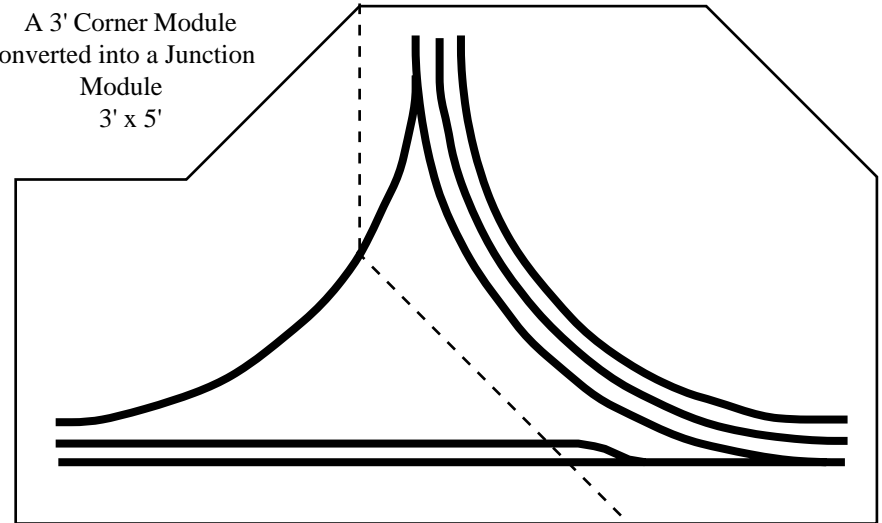
Layout using  
Junction Modules

When the layout is in operation, the two inner tracks of each oval are traditional NTRAK ovals. The outside track, however, goes completely around the layout. It can be 30 to 40 scale miles around one of these big layouts. The operator follows his train using radio throttles, either DCC or AristoCraft.

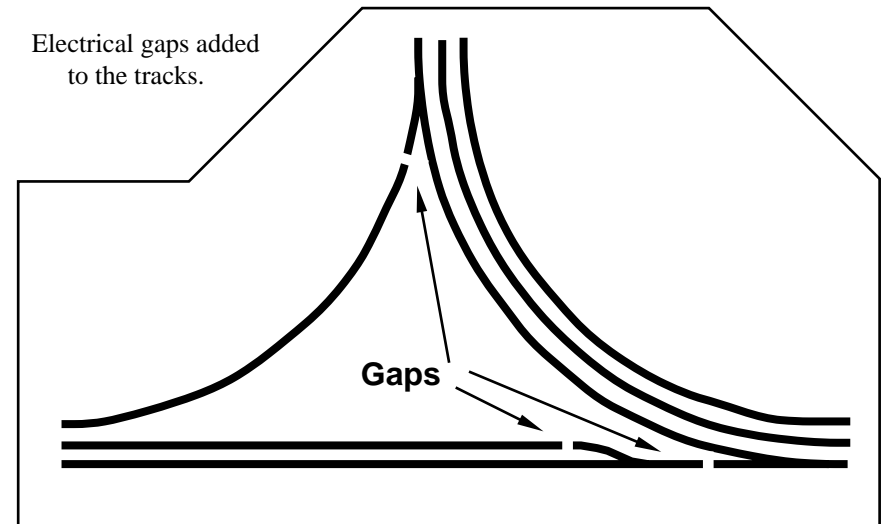
Junction modules are built in left and right hand versions and there are several track plans in use. Other versions are used for oNeTRAK layouts, shown on the next page.

You need three electrical gaps in the track and double pole, double throw switches to correct the polarity in the tracks connecting to the next loop.

A 3' Corner Module  
converted into a Junction  
Module  
3' x 5'



Electrical gaps added  
to the tracks.



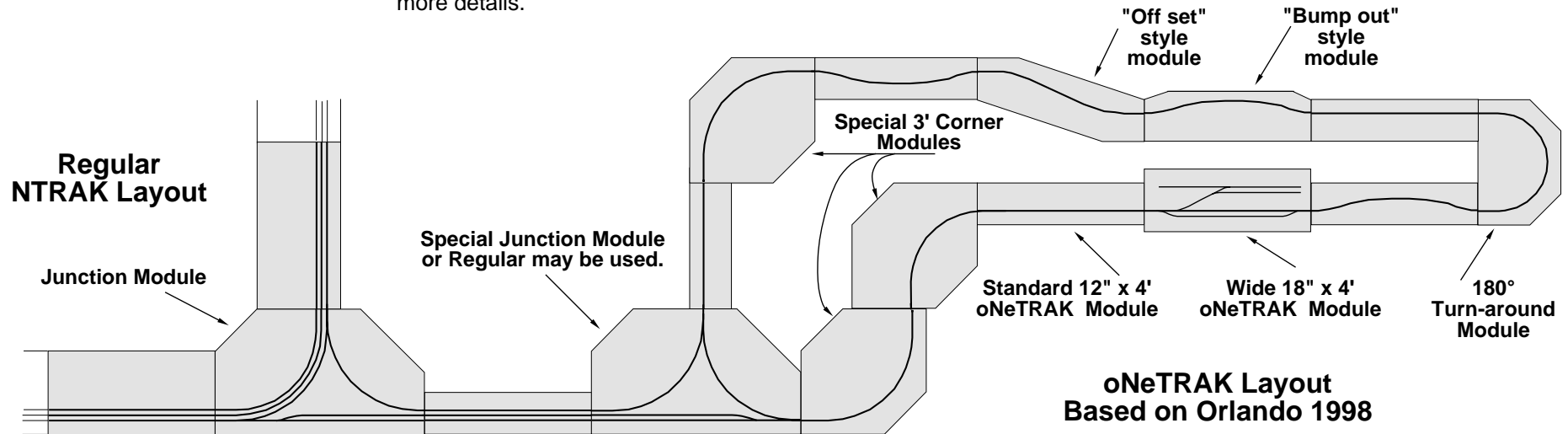
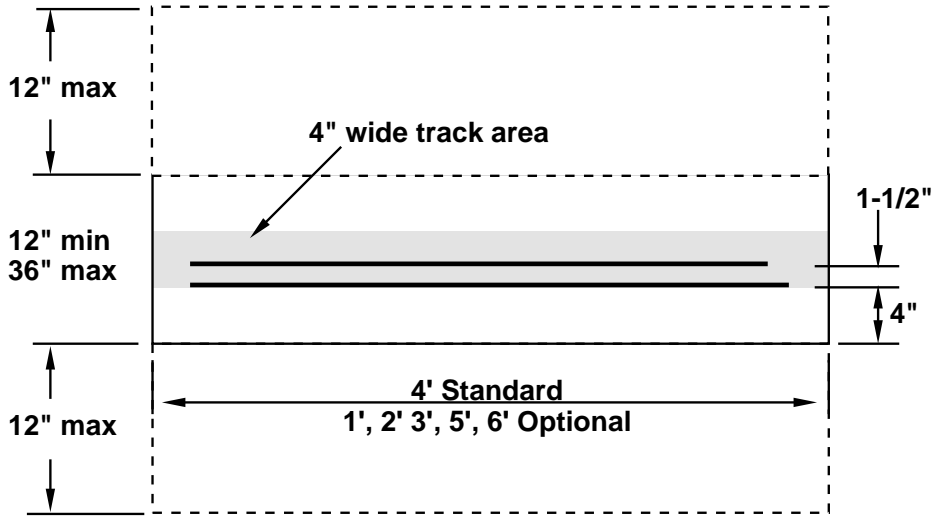
# oNeTRAK Modules

Pioneered by the Northern Virginia NTRAK Club, the basic module is a one foot wide and four foot long unit with a single track anywhere in the middle 4" area of the module. They can be wider, they can have two or more tracks, they can have an offset "S" bend or just about any design that you feel would be workable. The idea is to come off of a regular NTRAK oval and get into a branchline, single track, type layout that can be used for switching operations, possibly DCC controls and be free of the high density traffic on the NTRAK main layout.

The concept is proving popular with a number of clubs and individuals. The units can be used with, or as, a home layout. They are easily moved or taken to a big show. They can be used with or without a skyboard. The electrical wiring is the same as NTRAK and the height is the standard 40". For other heights, use a second set of legs. The narrower units are easy to transport or store.

At some of the big layouts, the oNeTRAK modules have made up a loop of their own within the big NTRAK layout. Grades may be used, if the group wishes it. Only shorter trains would be dispatched into this loop, leaving the main layout for the long trains.

The oNeTRAK Manual, \$3.00 gives more details.



## NTRAK MODULE GUIDELINES

### REQUIREMENTS

**SIZE:** The basic length is multiples of 2' (610mm). The height from floor to top of rail is 40" (1015mm) with adjustment for 1" (25mm) above and below that. The normal depth of modules is 2'(610mm). A skyboard is located at the rear of the module.

**TRACKS:** Three tracks are common to all modules and are regarded as "community property". The track centers are measured forward from the skyboard at each end of the module. The distance, name, and color code for these tracks are:

20" (508mm)	Front main, Red.
18.5" (470mm)	Inner main, Yellow.
17" (432mm)	Branch line, Blue.

Normal track connection between modules is with a 5" Atlas Snap track section (nominal length 4.910"). Code 80 nickel silver flextrack such as Atlas or Peco are recommended for the three "community property" tracks. If code 55 Peco, Railcraft or Shinohara track is used, the last inch or two should have Atlas rail for easy mating with the Atlas connecting tracks. For reliability reasons, sectional track or hand laid track is discouraged. Uncoupling ramps on the three tracks should be electric or, if the permanent magnet type, mounted to drop away or be easily removed. There are no trackwork restrictions on "private" tracks on the module.

The minimum radius for the two main tracks is 24" (610mm) and no grades are permitted. The Branch line minimum radius is 18" with a 1-1/2% grade limit (3/16" per foot). The first 4" in from the ends should be straight. Minimum track spacing is 1-1/4". Minimum setback from front of module is 2".

### WIRING:

120 V AC wiring is no longer used on NTRAK modules. Any accessories would be powered by an extension cord. See page 13 for details.

See page 11 for details on Cinch-Jones and Powerpole track power connectors.

Do not use common rail type track wiring. There should be no electrical connection between any of the rails of the three tracks. Use insulated gaps in both rails for any crossover tracks.

The module owner is to furnish two "C" clamps (at least 3" size) and four connecting track sections for each module; one w/ insulated gaps.

All switches and turnout controls should be clearly marked so that another person can quickly operate them in your absence.

### OPTIONS

**SIZE:** An additional 6" may be added to either or both the front and back of the module. Modules may be made narrower than 2', but except for "bridge modules" aren't encouraged. The preferred skyboard height above the rail tops is 14", but may be as low as 8" or as high as needed for your scenery. Skyboards may be remov-

able or permanent for scenery protection. On extra deep modules the skyboard should end even with the standard skyboard location. The skyboard may have artwork, commercial backgrounds, or just be painted a sky color. The back of the skyboard should also be painted, blue preferred. Module frame work and legs should be painted dark brown or flat black. "Diorama Dividers" may be used at the ends of the skyboard. Some groups set "standard hill contours" for blending scenery between modules.

Each module should have its own legs. Shared leg schemes are not recommended. "Bridge" modules and special modules without legs may be used with the approval of the meet coordinator, but must meet all track and wiring requirements.

Tunnels are discouraged on the three "community property" tracks. If used, provide easy access for track cleaning and re-railing of cars.

**TRACKS:** There are standard locations and color codes for additional tracks.

Mountain Division, Green, 4"(102mm) from skyboard, 3-1/8"(80mm) above normal height, 12" min. radius, 3% max. grade.

Set-up track, Green w/ yellow stripe, 1-1/4" behind front of skyboard.

Front passing track, Orange, 1-1/2" in front of Front main.

Narrow gauge (Nn3) tracks use Z gauge track and Marklin track sections as connecting tracks between modules. The rear track is 6" in front of the skyboard and 2.5"

above normal track height. Color code is Blue w/ Green stripe. The middle track is 15.5" in front of the skyboard and at track level. It is color coded Yellow w/ Green stripe. The optional front track is 22" forward and 2" below track height. It is coded Red w/ Green stripe.

Catenary tracks (NCat). The standards are shown on page 15 for modules using live overhead wire.

There is an optional location for the Branchline 10" from the skyboard. This avoids the three track mainline look.

Crossover tracks between the Mainline tracks and between the Inner main and Branch line track are suggested on 6' and 8' modules. They are optional on others. Peco large radius, USA made Atlas #6 or Shinohara #6 turnouts are recommended. Pre 1993 Atlas turnouts made in Austria have been a source of problems and are discouraged, as is steel rail track such as Rapido. Insulating gaps must be provided on both rails of any crossover tracks. There should be no common rail connection between any of the three "community property" tracks.

Transition curves are recommended to ease long cars into curves. Superelevation (banked turns) are NOT recommended.

Several units of any length may be combined to form a "module" that is a multiple of two feet (8', 14', etc.). The three tracks must be continuous, but only need to meet the standard spacing at the outer ends and meet the minimum 1.25" spacing elsewhere. Electrical connections only need to be standard at the ends.

## MATERIALS NEEDED FOR A 6' NTRAK MODULE

Where less is needed for a 4' Module [4] or more for an 8' Module [8], these are indicated below.

**TRACK:** (Minimum for Mainlines and Branch line, no spurs, sidings, etc)

18' - Flex track, Atlas, Peco, or equal. [4]= 12', [8]= 24'

4 - Turnouts, Shinohara #6 or Peco, large radius, #SL-388X, RH or 389X, LH. [4]= none required.

3 - 5" Atlas "Snap Track" sections.

1 - 2-1/2" Atlas 1/2 section. Used as spacing jig only.

Any accurately cut rail or rod 2.470" long may be used.

Ballast and cork roadbed as required.

### ELECTRICAL:

120 V AC wiring is no longer used on NTRAK modules. Any accessories would be powered by an extension cord. See page 13 for details.

See page 11 for details on Cinch-Jones and Powerpole track power connectors.

**LUMBER:** List depends on the construction method used.

Note: Finished lumber is smaller than sizes shown.

For plywood table top construction you would need:

1 - Skyboard, plywood, 3/8" or 1/2"x 18"x 72". [4]= 48", [8]= 96"

1 - Tabletop, plywood, 3/8" or 1/2"x 24"x 72". [4]= 48", [8]= 96"

16' - 2x2 lumber for legs and glue blocks. (legs 38" long)

16' - 1x4 lumber, for frames. [4]= 12', [8]= 20'

(1/2" or 3/4" ply may be used for frames.)

**HARDWARE:** Depends on construction method, but should include:

4 - Leg leveling bolts w/ nuts or "Tee nuts".

8 - Leg attachment bolts w/ washers and nuts or "Tee nuts".

2 or more bolts to mount Skyboard. "Eye bolts" may be used.

Misc flat head screws for assembly of frame.

Glue. Aliphatic resin, "Professional" type, preferred.

Paint, Dark Brown or flat Black for legs and frame. Light Blue for Skyboard.

## SUMMARY OF TRACK REQUIREMENTS AND OPTIONS

Track Req/ Opt	Dist frm Skyboard	Height	Min Radius	Max Grade	Color Code	
Front Main	R 20"	0"	24"	0%	Red	
Inner Main	R 18.5"	0"	24"	0%	Yellow	
Branch Line	R 17"	0"	18"	1.5%	Blue	
Branch option	O 10"	0"	18"	1.5%	Blue w/Yellow	
Mountain Division	O 4"	4"	+3-1/8"	12"	3% Green	
Set-up Track	O -1-1/4"	0"	?	?	Green w/Yellow	
Front Passing Trk	O 21.5"	0"	?	?	Orange	
Nn3 Front Track	O 22"	-2"	?	?	Red w/Green	
Nn3 Center Track	R* 15.5"	0"	?	?	Yellow w/	
Green						
Nn3 Rear Track	R* 6"	6"	+2.5"	?	?	Blue w/
Green						
NCat Front Track	R* 15"	0"	10"	?	Special plugs	
NCat Rear Track	R* 2"	0"	10"	?	Special plugs	

R\* = Required only on these modules. ? = No standards set.

## CATENARY MODULES

Electric type locomotives operating under live overhead wire are a feature of the NCat modules. Shown below are the required tracks for NCat modules. Additional tracks and sidings are the choice of the builder. Complete specifications and tips on building poles and stringing catenary wire are available

from the coordinator. More information is also on their web site:

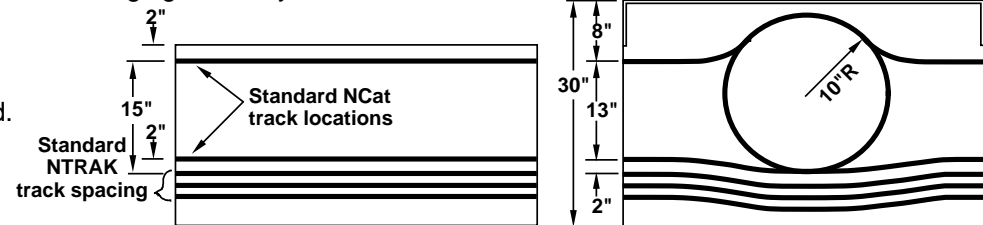
[www.teamsavage.com/ncat/ncat.html](http://www.teamsavage.com/ncat/ncat.html)

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This manual represents the experience and learning of many modelers since the NTRAK idea started in 1973. This is the fifth version of the manual. Over 30,000 copies of the previous versions have been printed. Changes in NTRAK specifications are made at infrequent intervals. Original modules will work with present modules.

## THINGS TO CHECK BEFORE YOU GO TO A MEET

1. Be sure that your module meets the current NTRAK Specifications.
2. Have all flangeways clear of ballast and turnouts working properly.
3. Check wheel gauge and couplers. Try your engines and long cars to be sure everything operates and that you have the proper clearances.
4. Have your controls working, clearly marked, and color coded.
5. Your scenery should look so great that you don't have to apologize!

## THINGS TO TAKE ALONG

1. For each module: two "C" clamps, four connecting tracks, one w/insulating gaps. (Remove one tie or undercut so that rail joiners go fully on at one end of all connecting track sections.)
2. Any tools needed for assembly and any tools, glues, paint, etc. for last minute repairs of the module. Have your name on everything!
3. Throttle and cords, if needed.
4. Cars and engines all marked for easy identification with your personal code. An inventory list can be a big help. Don't leave engines on the layout overnight or on a siding in easy reach during the show. Be very watchful of your things during tear down. Security is lax then, and, in the confusion, things can disappear.
5. If you plan to enter your module in a contest, it may have to be in the contest room for judging. If so, you should furnish a three track "bridge" so the layout can operate while your module is being judged.

## IF YOU ARE COORDINATING A MEET

**CONFIRM THE SPACE:** Measure the space yourself or have someone do it for you. The hotel or exhibit hall drawings are often quite optimistic. One room was about two feet smaller in both directions than advertised. While you are setting up is NOT the time to find out about this. Note locations of pillars that might interfere with the layout, visitors entrance, the loading dock area, and parking.

**ELECTRICAL:** Check the location of electrical outlets. Avoid having cords across an aisle if possible. In some exhibit halls they can place outlets overhead to suit. Locate circuit breakers and light switches.

**SET UP:** Find out when you can start setting things up and the hours of the show. Start set up as early as possible so that the layout is running smoothly for the visitors.

**TEAR DOWN:** Be sure that everyone knows when layout tear down will start. One person can't pull his module out ahead of time and leave without advance warning and planning. The NTRAK layout shouldn't be torn down while other exhibits are still open.

**APPEARANCE:** For a good appearance, the legs of the modules and the boxes of tools and junk should be hidden by a drape. These are often furnished by the convention, or tablecloths can be thumb tacked in place. Check ahead of time. For public shows a barrier about two feet out from the layout is a necessity.

**LAYOUT PLAN:** Have a layout plan made up ahead of time. Copies should go to all participants. The first persons to get to the set up should know where the layout will be and the arrangement of the modules.

**ELECTRICAL:** The modules should be checked electrically before they are connected

together. Plans for a special checker are shown in the 'How-to' book.

**LEVELING:** If the floor is level, start with all modules at 40" height. Floor tiles or carpet patterns can be a big help in getting the layout square. A fishing line pulled taut can be used in leveling modules. An "eyeball" check for dips, humps, zigs and zags is also helpful. On very large layouts a transit or builders level is useful, if you have people who know how to use them. Cumulative errors can make one side of the layout longer than the other. Two foot lengths of 2x4, 1x4 or 1/2" plywood can be clamped between modules as needed to even things up and then fit with filler track as needed.

**BRIDGE MODULES:** A 2' and 4' three track "bridge" can be useful in case some module doesn't show, or if the module lengths that are available don't come out even. The bridge makes a good "duck under" entrance to the operating pit. If any of the modules are to be moved into the contest room for judging, then the builder should furnish a "bridge" while his module is out of the layout.

## SET UP SEQUENCE

1. Get module legs in place and adjust so the roadbed is 40" above floor. (It is easier to measure to the roadbed.)
2. Make electrical check of each module before connecting to other modules.
3. Clamp modules together, level, and align.
4. Put gapped rail connector tracks at block boundaries.
5. Put in all other connector tracks.
6. Connect 110 and track wiring connectors between modules. (Don't connect track wiring at gapped rail tracks.)
7. Connect throttles.
8. Have fun!!!